

# Effect of Mixed Populations on Extreme Flood Flow Estimates

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## BIOGRAPHICAL SKETCH

Mr. Countryman worked for the U.S. Army Corps of Engineers from 1966 through 1988 (22 years). His duties included flood control hydrology, hydraulic design, water resources planning, and design of hydraulic structures. In addition, he was involved in the operation of flood control reservoirs in California, and Colorado. In 1988 he joined MBK Engineers and in 1992 became a partner in the firm and is currently the president of MBK Engineers. While at MBK he has worked on a diverse array of flood control projects ranging from reservoir reoperation to the design of flood control facilities. He has also served as an expert witness in numerous flood litigation cases.

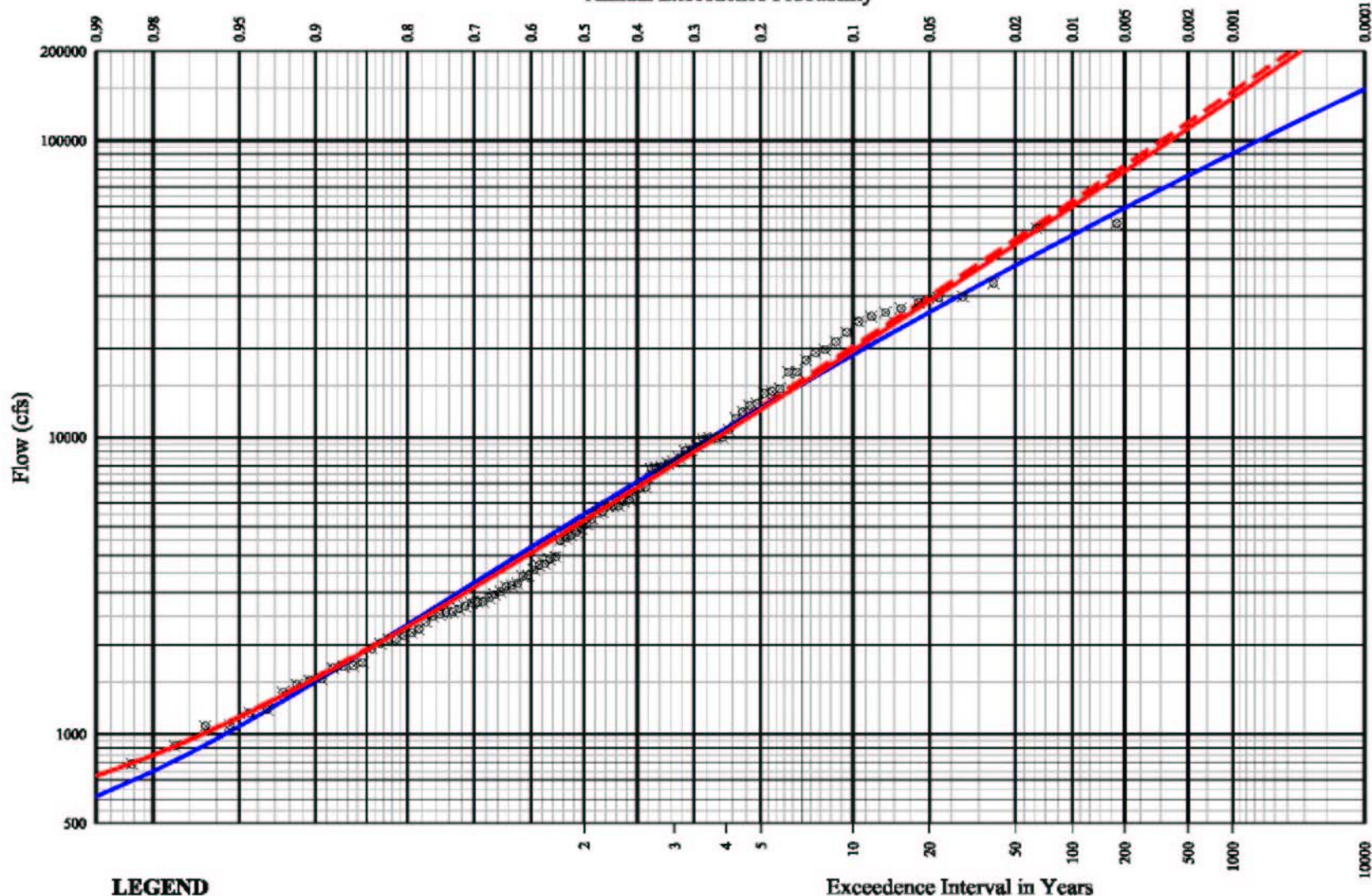
## EDUCATION:

California State University, San Jose  
BS in Civil Engineering, 1966

## PROFESSIONAL LICENSES, SOCIETIES AND HONORS:

Registered Civil Engineer, California, 20486  
Registered Civil Engineer, Nevada, 8086  
Member, American Society of Civil Engineers  
Award of Distinction, San Jose State University, College of Engineering

Annual Exceedence Probability



**LEGEND**

	Period of Record	Mean	SD	Skew
Recommended	1904-2003	3.727	0.438	-0.2
Corps 1998	1904-1997	3.736	0.442	0.1
Corps 1904-2003	1904-2003	3.727	0.438	0.1
Historical Data	1904-2003			

(Based on Gringorten plotting position)

Note: Drainage area is 1638 square miles.

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San Joaquin River at Friant Dam

**3-Day Unregulated Frequency Curve Comparison**

JOB NUMBER:	4919
REQUESTED BY:	BT
DRAWN BY:	RDS
DATE:	December 2003

# LP III Advantages

- Acceptable Curve Fit
- Allows easy computation of Statistics
- Blessed by Federal Government
- Gives the illusion of Scientific Analysis

# LP III Problems

- Is based on converting real data to logs for analysis
- Regional Skew Map is grossly inaccurate
- Extreme values (large floods ) can be grossly overestimated
- Used without understanding as if it represents a law of nature

# Mathemativity

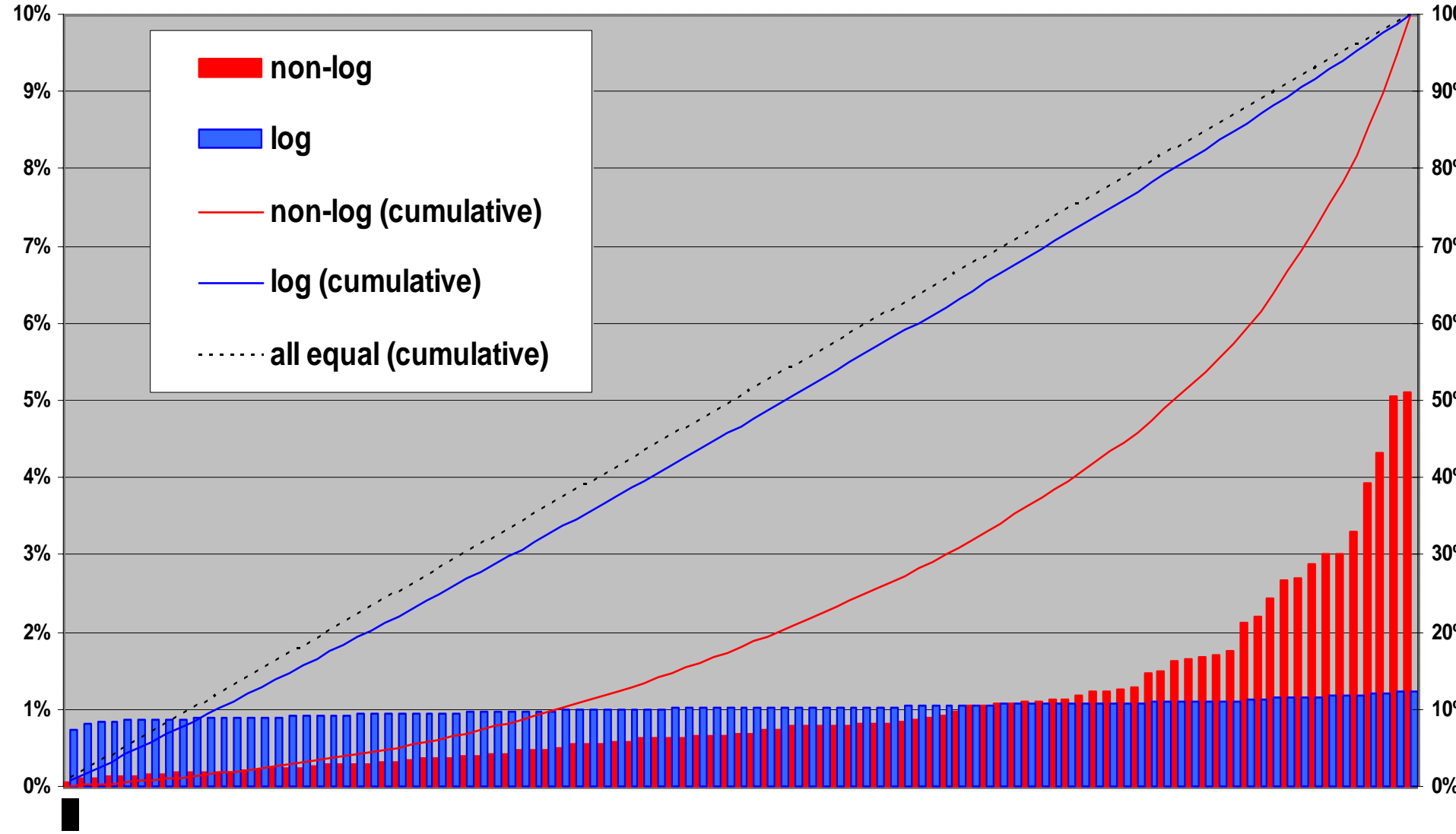
**“In such areas as sociology, psychology, education, and even, I sadly say engineering, investigators who are not themselves statisticians sometimes take mathemativity seriously. Overawed by what they do not understand, they mistakenly distrust their own common sense and adopt inappropriate procedures devised by mathematicians with no scientific experience.”**

G.E.P. Box

Journal of Science and Statistics

# American River at Fair Oaks

## 3-Day Unregulated Flows



# Vit Klemes

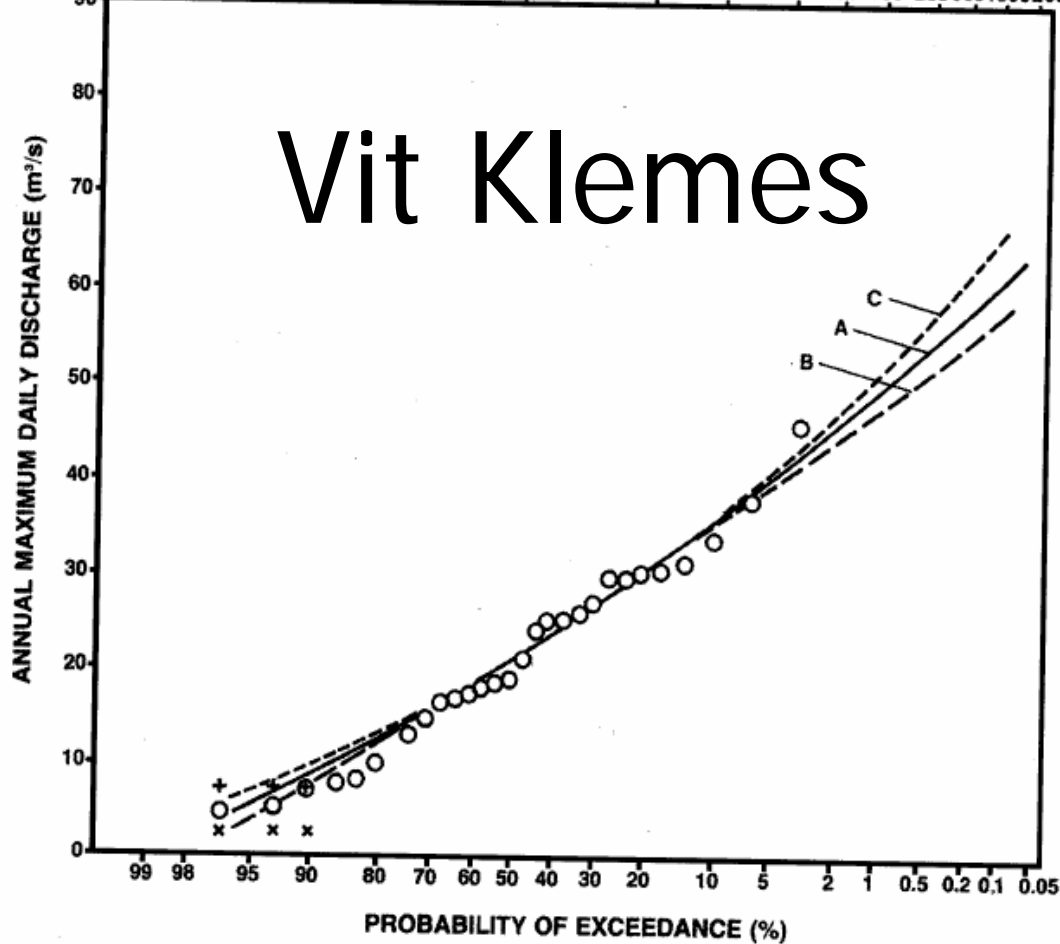
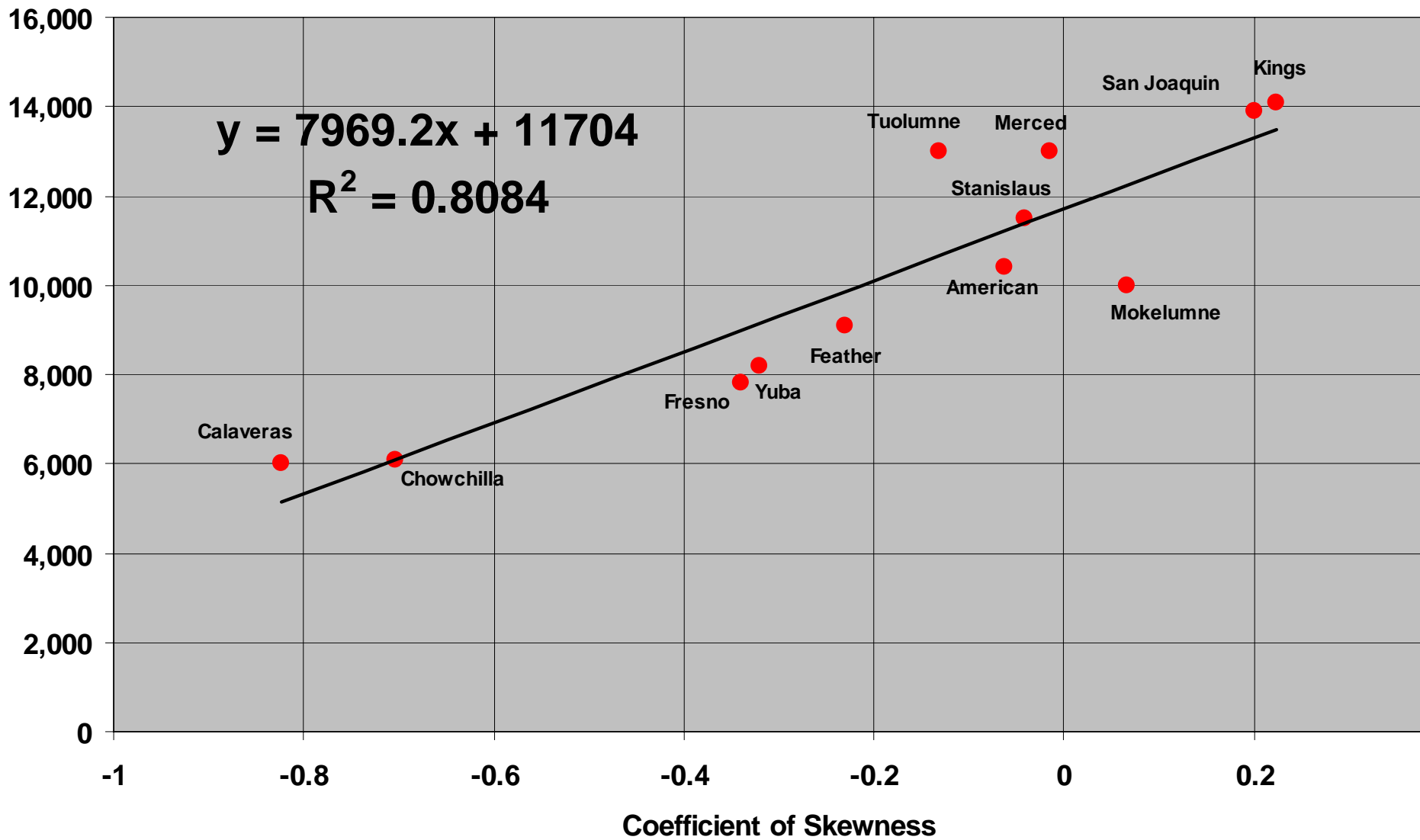


Figure 5.

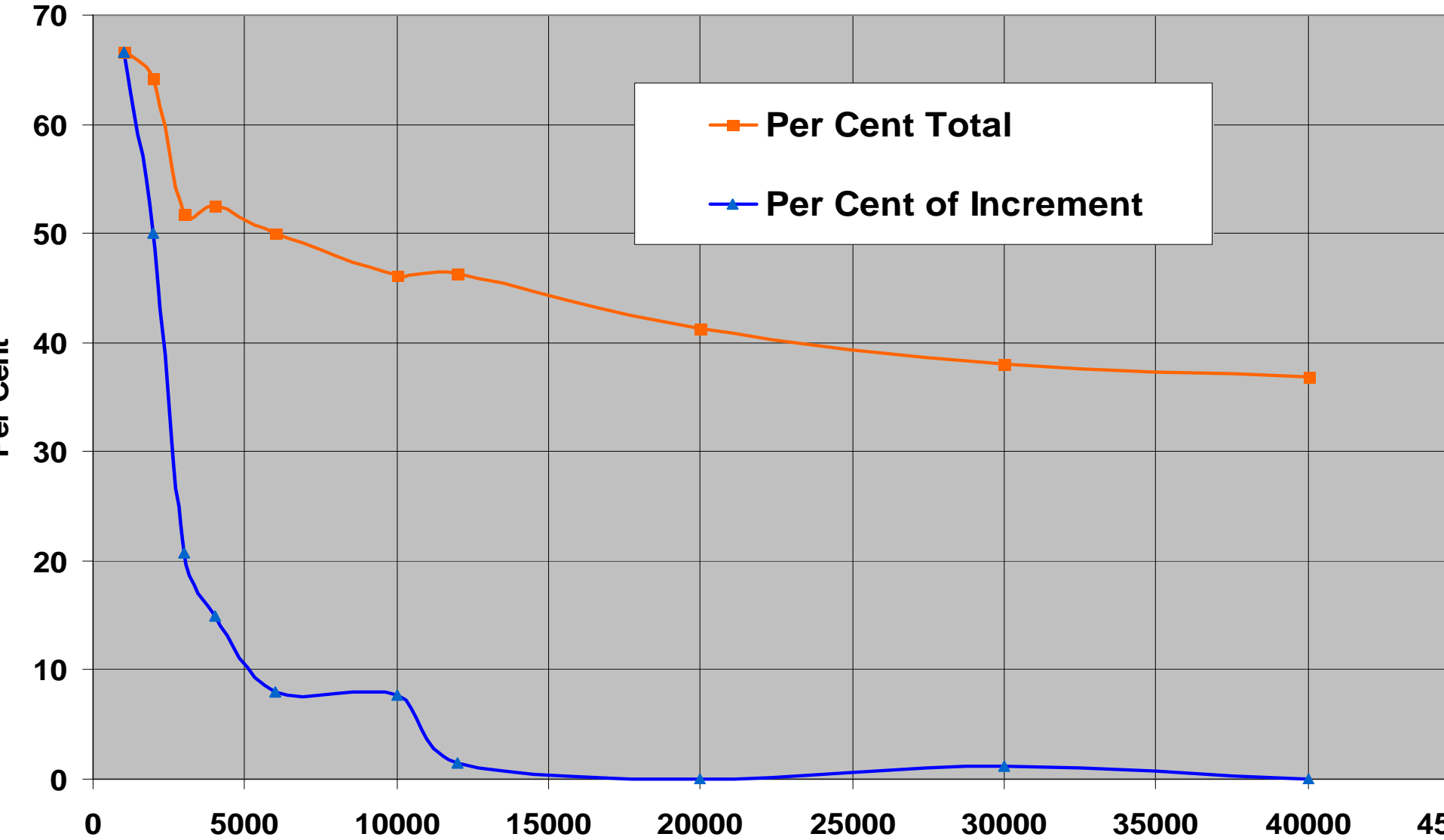
Results of flood frequency analysis for data shown in Figure 4b (excluding the Hurricane Hazel flood of 1954) obtained by a maximum likelihood fit of a three-parameter lognormal distribution using a Flood Frequency Analysis Package developed and operated by Water Resources Branch of Environment Canada, Ottawa. (A) Fit to historic data. (B) Effect of an arbitrary reduction of the three lowest records to  $3 m^3/s$ . (C) Effect of an arbitrary increase of the three lowest records to  $7.5 m^3/s$ .

# Basin Elevation vs. Skew



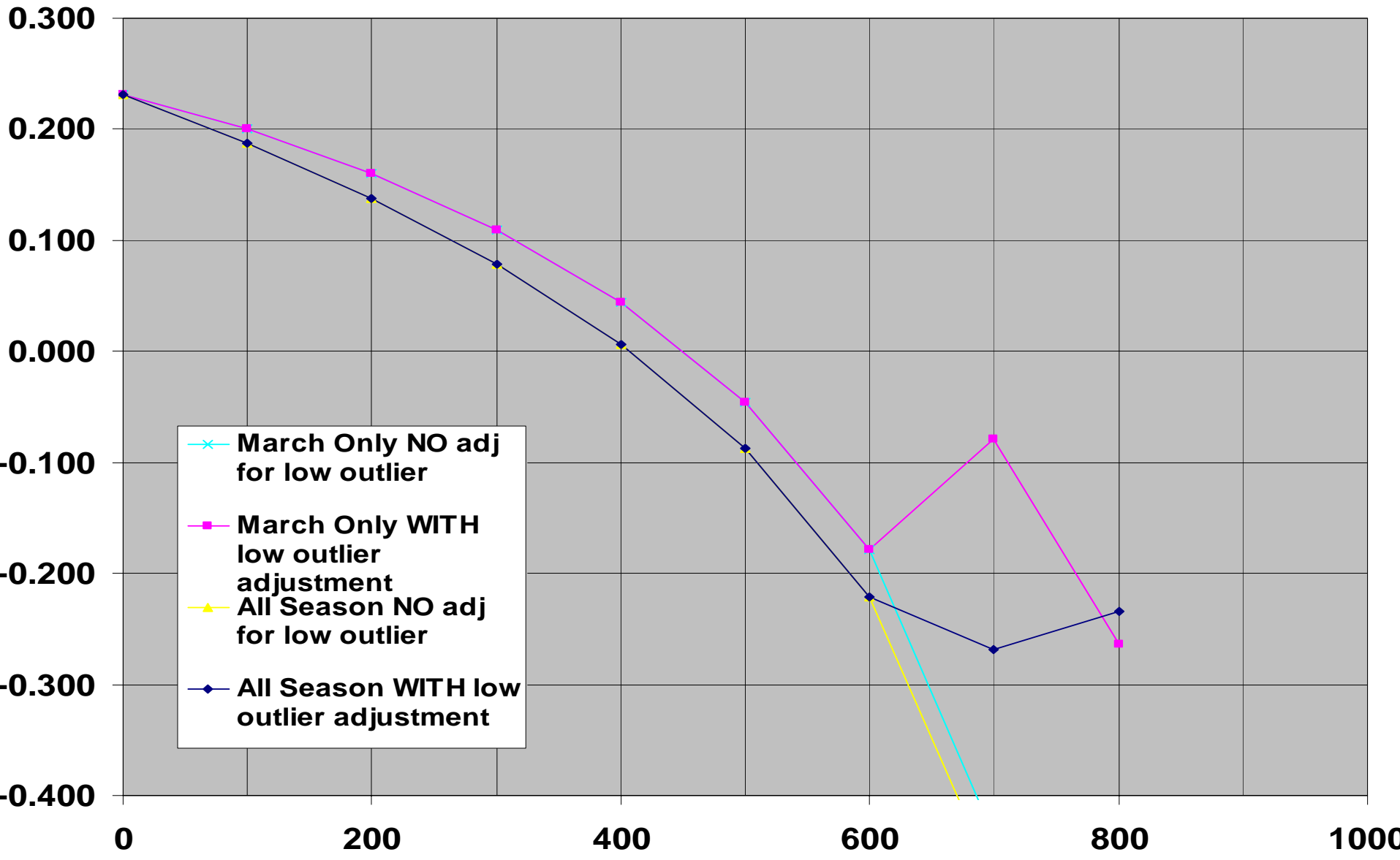


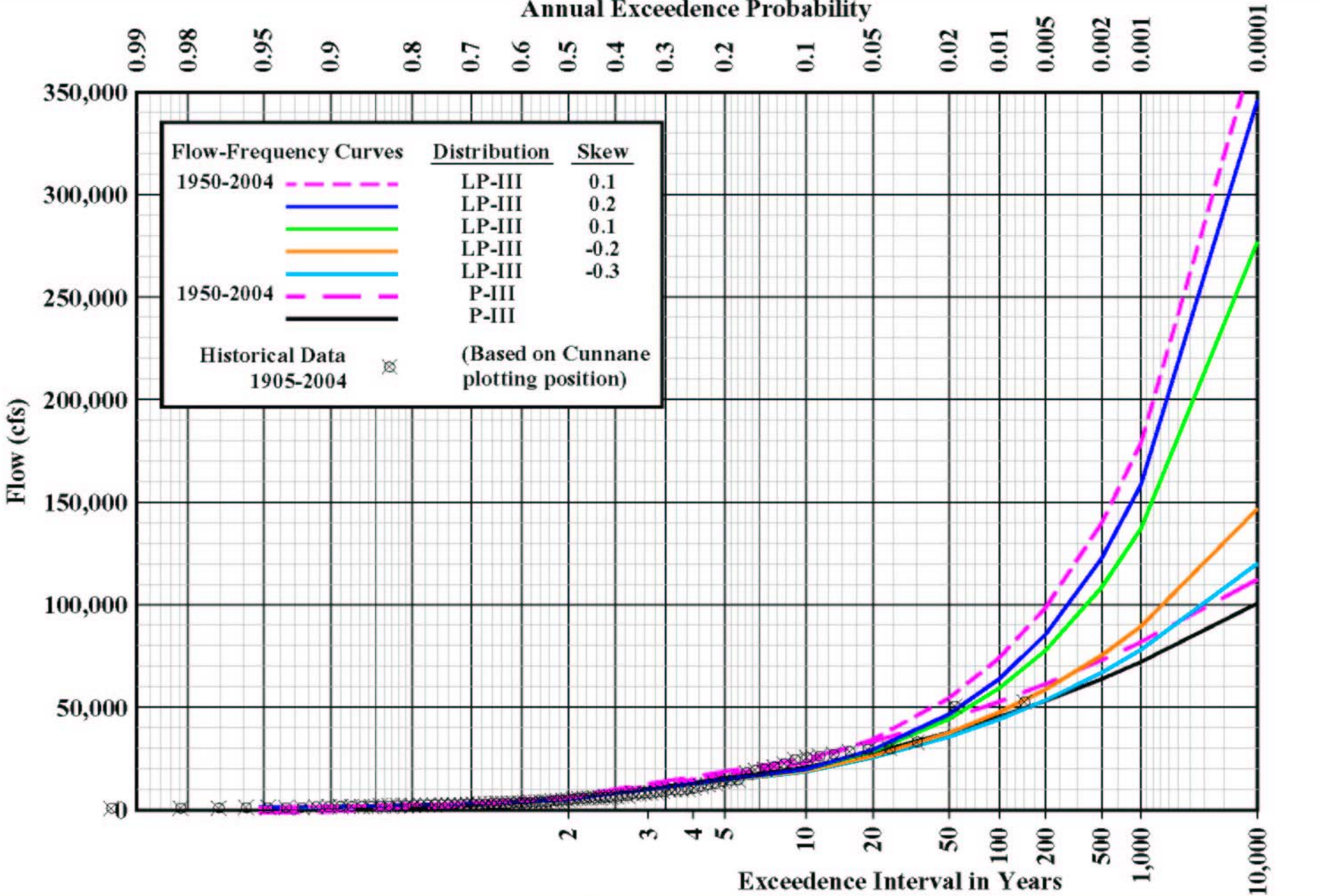
# San Joaquin River March Flows



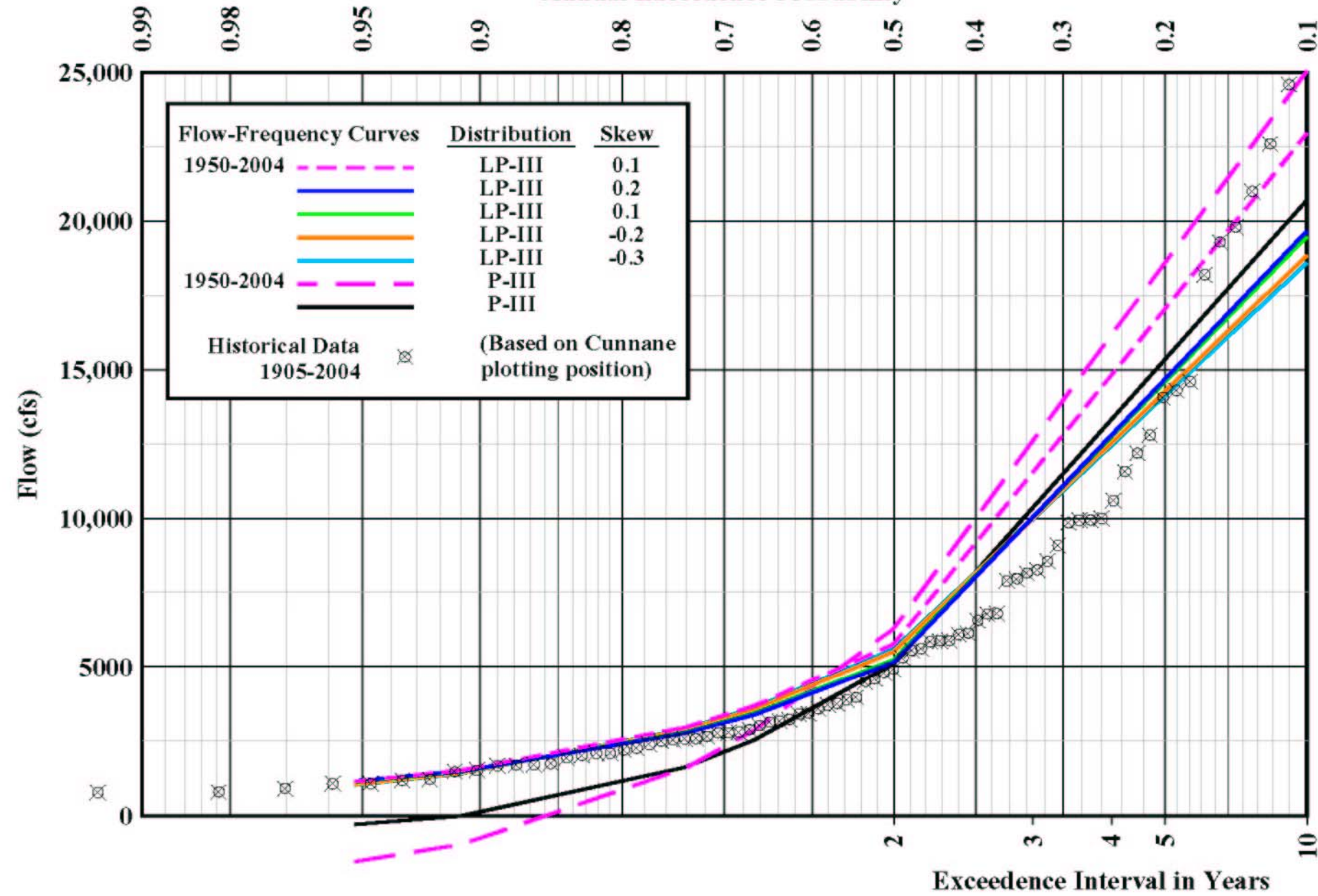
# San Joaquin River

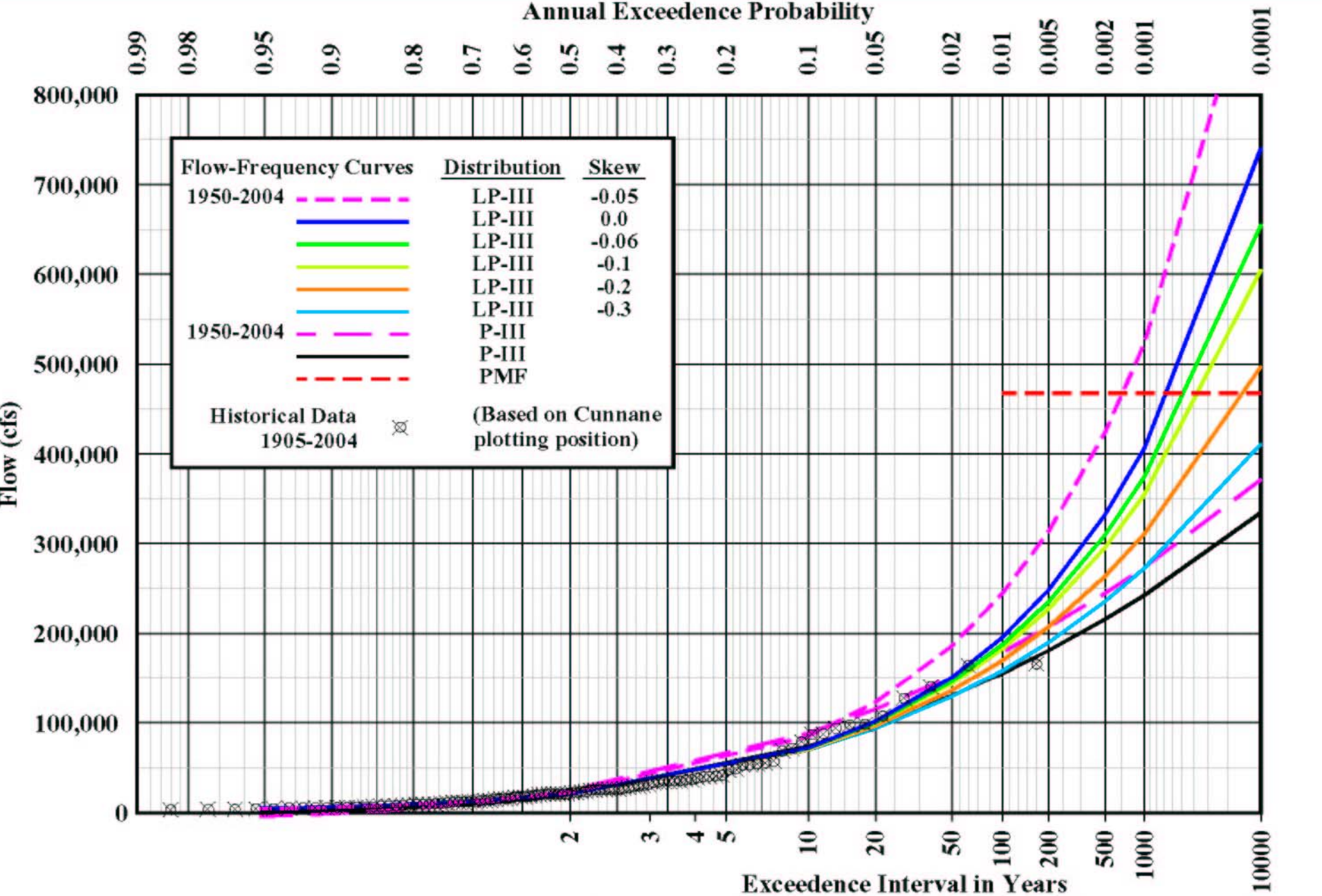
## Low Flow Impact on Skew



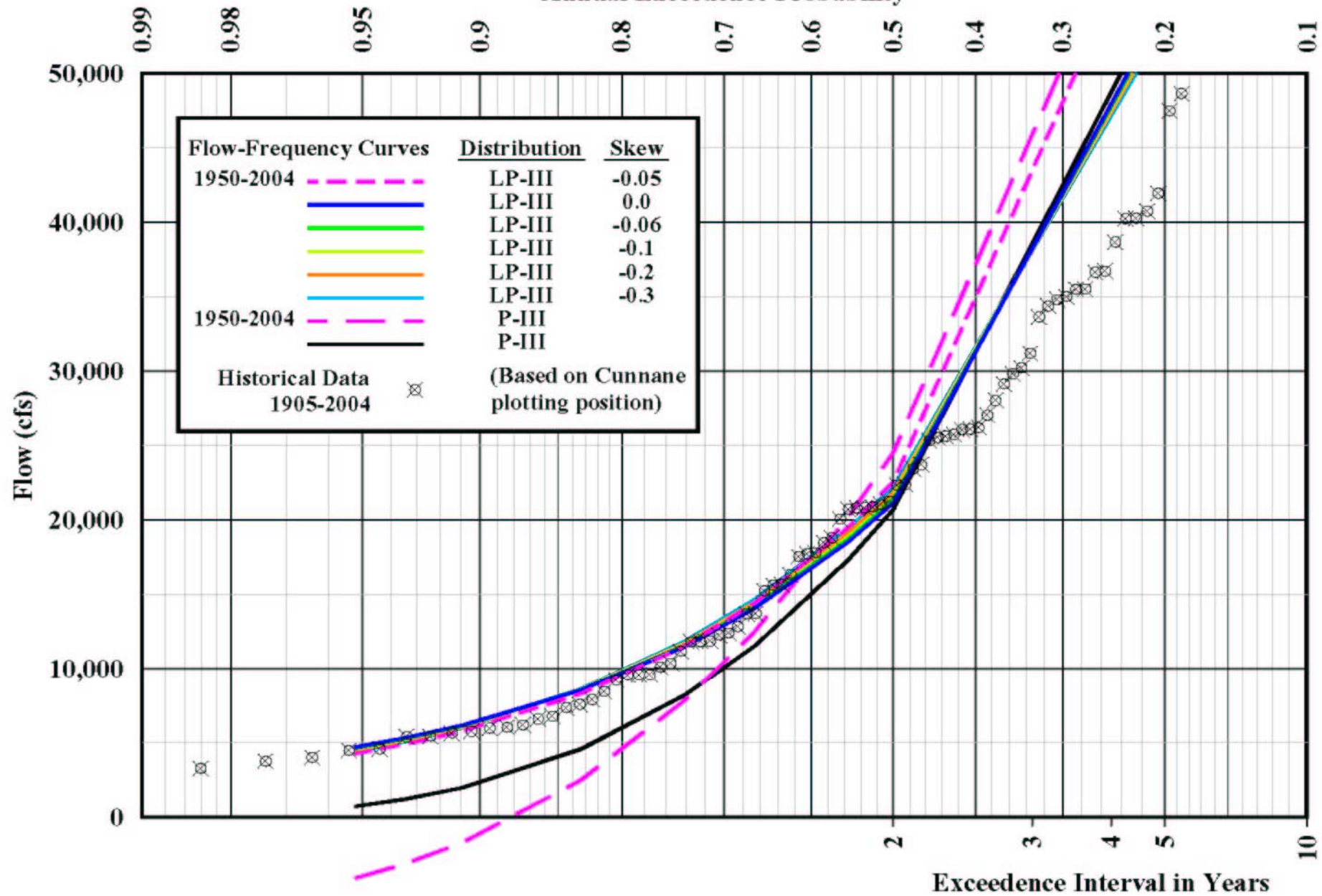


# Annual Exceedence Probability



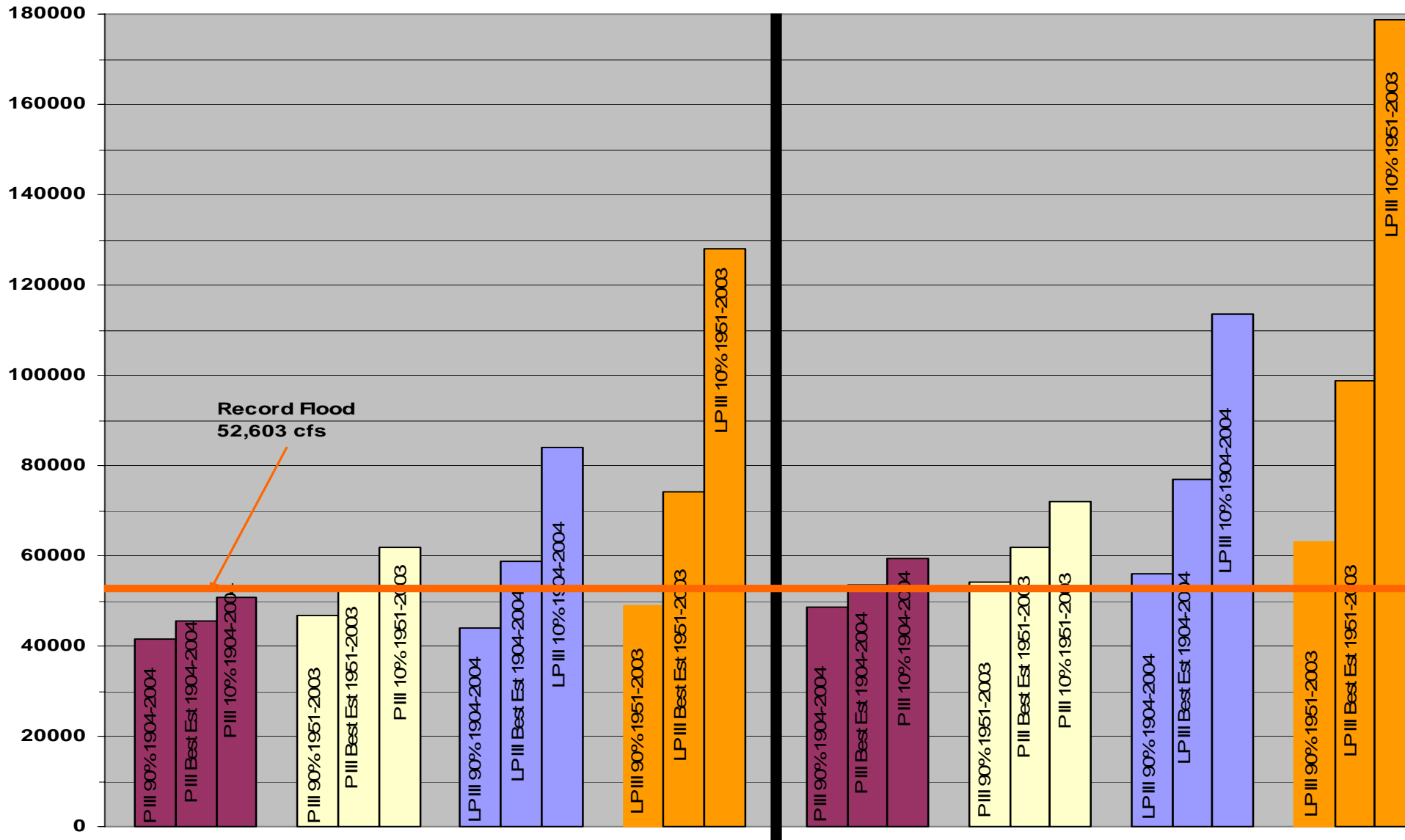


# Annual Exceedence Probability



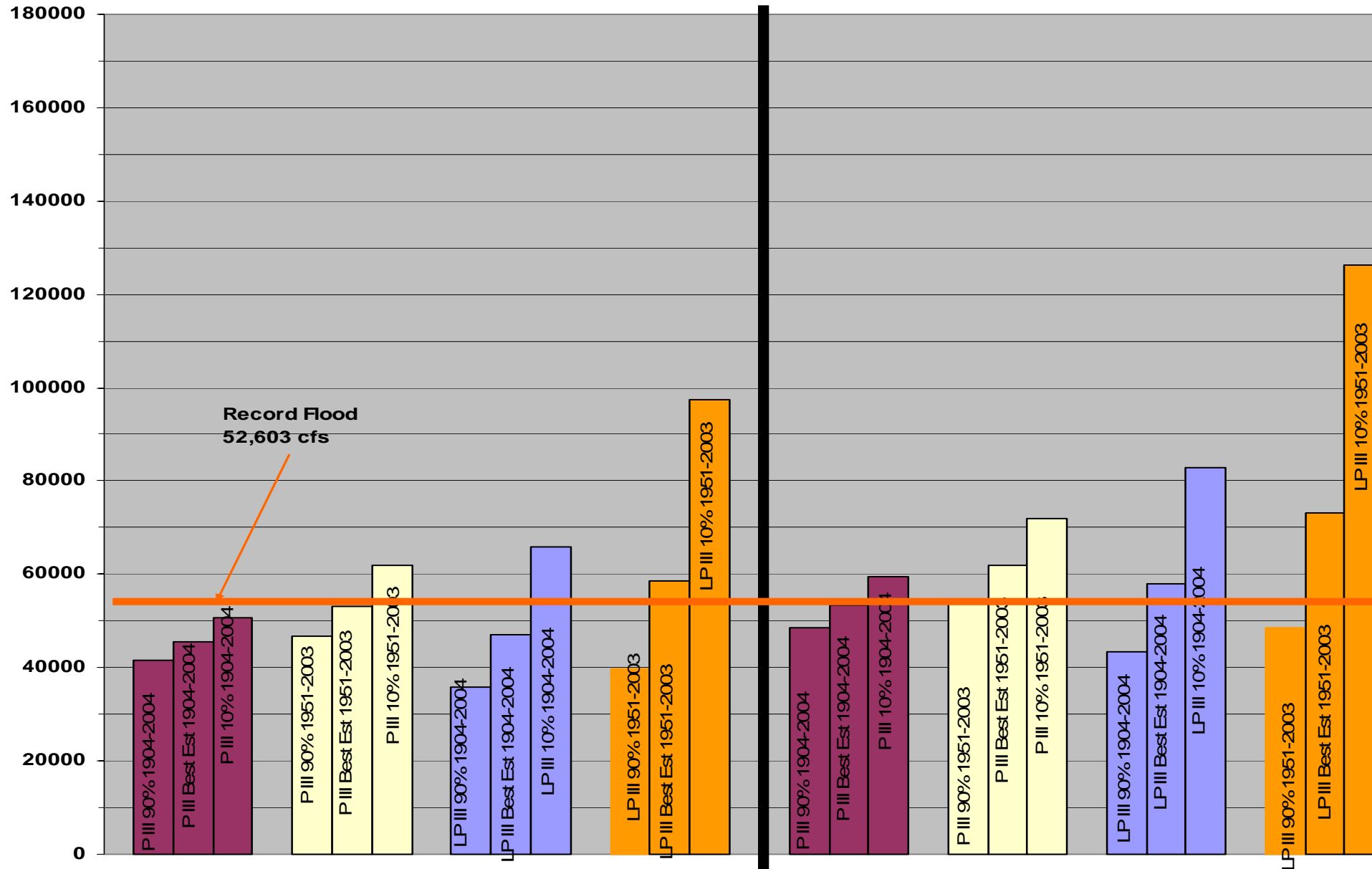
# San Joaquin River

## LP III Skew = 0.1



# San Joaquin

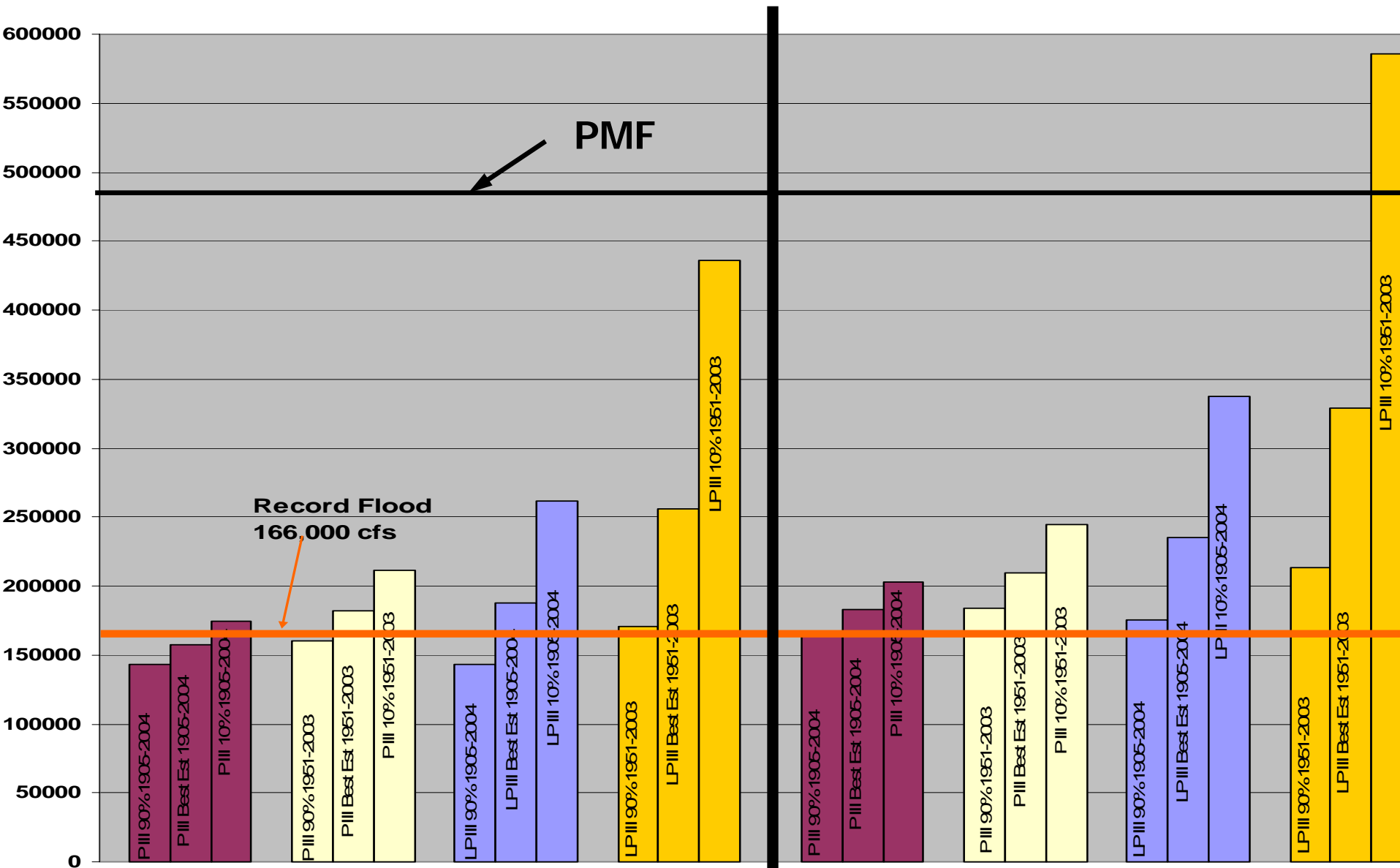
## LP III Skew -0.2





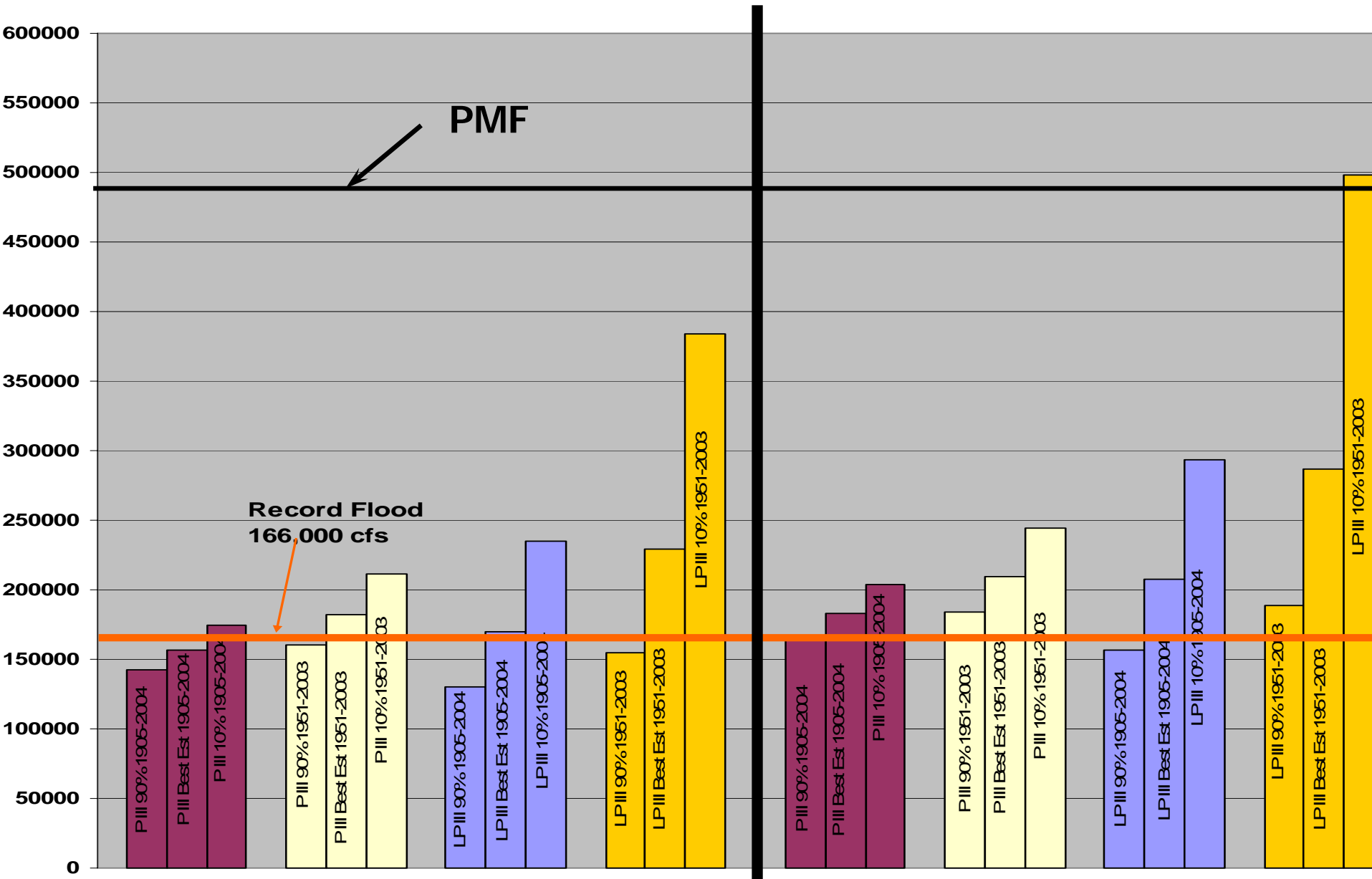
# American River

## LP III Skew = -0.06



# American River

## LP III Skew = -0.2



	Area Sq. Miles	Record	Elevation, Ft MSL	Skew	Max cfs	
<b> Kings River at Pine Flat Dam</b>	<b>1,545</b>	<b>104</b>	<b>14,100</b>	<b>0.1</b>	<b>46,000</b>	<b>47,400</b>
<b> San Joaquin @ Friant Dam</b>	<b>1638</b>	<b>100</b>	<b>13,900</b>	<b>0.1</b>	<b>53,000</b>	<b>62,500</b>
<b> Kolumne River @ Camanche Dam</b>	<b>627</b>	<b>93</b>	<b>10,000</b>	<b>0.1</b>	<b>39,000</b>	<b>46,700</b>
<b> Red River @ New Exchequer</b>	<b>1037</b>	<b>96</b>	<b>13,000</b>	<b>0.0</b>	<b>44,000</b>	<b>53,000</b>
<b> Stanislaus River @ New Melones Dam</b>	<b>904</b>	<b>82</b>	<b>11,500</b>	<b>0.0</b>	<b>50,000</b>	<b>63,200</b>
<b> American River @ Fair Oaks</b>	<b>1888</b>	<b>93</b>	<b>10,400</b>	<b>-0.06</b>	<b>166,000</b>	<b>196,100</b>
<b> Kolumne River @ New Don Pedro Dam</b>	<b>1533</b>	<b>101</b>	<b>13,000</b>	<b>-0.1</b>	<b>92,000</b>	<b>87,900</b>
<b> Feather River @ Oroville Dam</b>	<b>3611</b>	<b>96</b>	<b>9,100</b>	<b>-0.2</b>	<b>244,000</b>	<b>294,800</b>
<b> Yuba River nr Marysville</b>	<b>139</b>	<b>94</b>	<b>8,200</b>	<b>-0.3</b>	<b>124,000</b>	<b>144,200</b>
<b> Feather River @ New Bullards Bar Dam</b>	<b>489</b>	<b>94</b>	<b>8,200</b>	<b>-0.3</b>	<b>67,000</b>	<b>64,800</b>
<b> Fresno River @ Hidden Dam</b>	<b>234</b>	<b>85</b>	<b>7,800</b>	<b>-0.3</b>	<b>6,900</b>	<b>11,100</b>
<b> Sacramento River @ Michigan Bar</b>	<b>536</b>	<b>91</b>	<b>6,000</b>	<b>-0.5</b>	<b>35,000</b>	<b>24,600</b>
<b> Feather River @ New Hogan Dam</b>	<b>363</b>	<b>53</b>	<b>6,000</b>	<b>-0.6</b>	<b>18,000</b>	<b>24,600</b>
<b> Feather River @ Buchanan Dam</b>	<b>235</b>	<b>85</b>	<b>6,100</b>	<b>-0.7</b>	<b>10,000</b>	<b>12,600</b>

# Bulletin 17B

- “Major Problems in flood frequency analysis at gaged locations are encountered when making flood estimates for Probabilities more rare than defined by the available record. For these situations the guide ... allows considerable latitude in analysis”

# Summary

- Regional Skew values in Bulletin 17 B should never be used in California
- LP III is very sensitive to low flows
- LP III Skews near -0.3 approximate Pearson Distribution
- LP III based on last 53 years Unreasonable

# Summary Cont

- LP III confidence bands very large and cause question of 90% CNP criteria
- Frequency Curves should be evaluated with Pearson Distribution. If fit is reasonable with plotted data and historical or PMF data **use it**
- If LP III is used, skew values should be carefully evaluated